1.

(a)	(i)	-700(kPa);	1
	(ii)	I arrows drawn from F to G, F to E and from G to E; (allow ecf)	1
		II Water molecules move down a water potential gradient / from a{higher /less negative} water potential to a{lower /more negative} water potential; By osmosis; (in correct context)	2
(b)	(i)	50% of the cells were plasmolysed;	1
	(ii)	-430kPa; (At incipient plasmolysis) {the pressure potential equals zero/ the solute potential = water potential};	2
		Question 7 Total	**[7]**

2.

(a) Quaternary/ 4°; 1

(b) (i) (Labelled) arrow in correct position; 1

(ii) COOH/ carboxyl/ carboxylic acid; 1

(iii) Disulphide {bond/ bridges} / ionic bonds / hydrogen / hydrophobic interactions / Van der Waals; (Any 2) 1
NOT peptide / S-S (covalent – neutral)

(c) **Mark points must be comparative** Max 2

phospholipid	**triglyceride**
2 fatty acids	3 fatty acids;
phosphate (head)	do not contain a phosphate (head)
polar/hydrophilic head and non-polar/hydrophobic tails	non-polar/hydrophobic;

(d) (i) {Heads/ phosphates} are {hydrophilic/ polar} and are {attracted to/ in} the water; 2
{Tails/ fatty acids} are {hydrophobic/ non polar} and are {repelled by/ above/ avoid} water;
NOT react/ dissolve with water

(ii) 6.1(m^2); 2
The phospholipids are {arranged in/ formed} a {bilayer/ double layer} in the membrane;
Ref to phospholipid bilayer alone- insufficient

Question 4 Total **[10]**

3.

(a) (i) *Oxygen* — 2

by (simple) diffusion;

through the phospholipid (bilayer);

(ii) *Phosphate ions* — Max 2

by {facilitated diffusion/active transport};

through {carrier /channel}proteins/ protein pumps (active transport); (not channel proteins with active transport)

NOT intrinsic

Pass through hydrophilic pore; (not with active transport)

(b) (i) Active transport; — 1

(Between 0-30au) the concentration of phosphate ions is lower outside (the root)/higher inside (the root)/ Ions are being taken up against a concentration gradient; — Max 2

With oxygen present (aerobic) respiration can occur;

Providing {ATP/ energy} (for active transport)/ active transport needs {energy/ ATP};

(ii) There are a {limited/fixed} number of {carriers/ proteins/ channels} (for phosphate ions) in the membrane; — 2

(The curve levels off/the rate of uptake becomes constant) when all of the {carriers/ channels/ proteins} are in use;

(iii) (Ions are being taken up by) facilitated diffusion; — 2

Uptake {only begins/ occurs} when the external concentration is higher than the concentration inside the root hair cells/ down a concentration gradient;

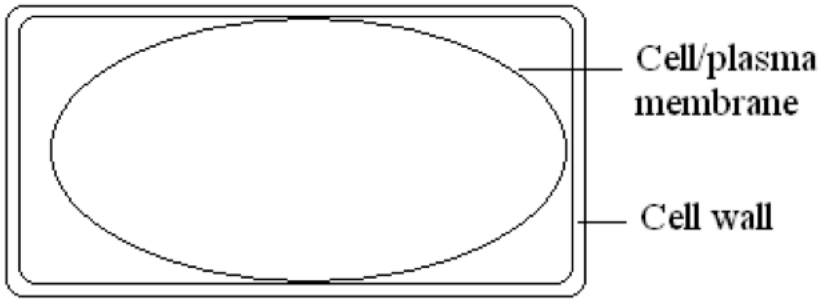
(c) They are a {component of/required to synthesise} {DNA/ RNA/ ATP/ NAD/ FAD/ NADP/ nucleotides/ nucleic acids}; — 1

Question 5 Total — **[12]**

4.

(a)	(i)	two layers/ double layer of phospholipids; NOT bilayer	1
	(ii)	fatty acid;	1
	(iii)	Any 2 from: transport/ form hydrophilic pores/ active transport/ channel proteins/ facilitated diffusion; receptors/ cell recognition; enzyme systems;	2 max
(b)		Decreased fluidity/ rigid membrane - cells/ membranes more easily damaged (as blood flows)/ cannot pass through capillaries so easily; Membrane proteins change shape / denatured {carriers/ receptors/membrane enzymes} - so {reduced/no} {transport/movement} of molecules;	2
(c)		Any 2 from: {Unrestricted/ uncontrolled} {Cell division/mitosis}; Forming a mass of cells/ tumour; Preventing {normal cells/ organs} from functioning;	2 max
		Question 5 Total	**[8]**

5.

(a)	(i)	{0.0M/distilled water} increase in mass **and** {1.0M/ sucrose solution} decrease in mass;	1
	(ii)	Turgid;	1
	(iii)	Water moves out of the {cell/ potato}; By **osmosis**; The external solution has a {lower water potential than the cell/is hypertonic/ more negative}/ ORA ; Potato becomes flaccid/cells are plasmolysed;	3 max
	(iv)	Isotonic;	1
	(v)	1. Where the line crosses the {X/ horizontal axis} there is no change in {mass/weight}; 2. So $\psi_{cell} = \psi_{external\ solution}$ (can be expressed in words); 3. This is 0.3(M) sucrose; (must be linked to point 1 or 2) 4. And converts to -860kPa from the (conversion) table; 5. (So ψ_{cell} potato) = -860kPa;	3 max
(b)		 • 1 mark for correct drawing of a plasmolysed plant cell(at any stage); (cell wall must be double line) • 1mark for correct labelling of a plasmolysed plant cell (plasma membrane pulled away from cell wall – both labelled correctly/ accurately);	2
		Question 7 Total	**[11]**

6.

(a)		A = phospholipid head/hydrophilic head/phosphate/polar group;	1
		B = hydrophobic tails/ fatty acids/ non polar tails: (Not: tails/ lipid layer)	1
		C = transmembrane protein/ carrier protein/ channel protein/ intrinsic protein.	1
(b)	(i)	As lipid solubility increases the rate increases; NOT rate of reaction Membrane contains (a double layer) of phospholipids/ Lipid soluble substances can {move/pass/ diffuse} through the membrane (more easily than water soluble substances.) (any two)	2
	(ii)	small molecules diffuse faster(or converse);	1
		Higher kinetic energy/ easier to pass between phospholipid molecules.	1
(c)		concentration/ diffusion gradient/ concentration difference; {amount/number} of carriers/ channel proteins/ larger surface area contains more carrier proteins; temperature. (any two)	2

(d) vitamin B_1 – polar/ ionic; 2

Cannot pass through phospholipid layer/ hydrophobic region;

Uses protein channels/ carriers/ transport proteins/

Hydrophilic (lining to) channels;

(any two)

Vitamin K - non polar/non ionic;

dissolves in phospholipid/ hydrophobic regions; 2

so can pass (directly) through phospholipid/ hydrophobic

regions;

(any two)

(Total 13 marks)

7.

(a) (i) OH and H removal shown on diagram; 3
formation of water (H_2O) shown;
dipeptide correctly drawn with C joined to N;

(ii) Condensation; 1

(iii) Peptide; NOT dipeptide; 1

(b) (i) Mosaic: Proteins are scattered (in lipid layer); 2
Fluid: molecules / components / (phospho)lipids / proteins are free to move around;

(ii) B; 1

(iii) Drawing shows a lipid bilayer with A and B in the correct places, B intrinsic (through the middle) A extrinsic (on top or bottom, outside phosphate heads); 1
Need not use N and P, but must be clear which is A and B
any 1 correct label from phospholipid / hydrophobic / hydrophilic / cholesterol / phosphate (head) / lipid or fatty acid (tails); 1

(iv) Cell {recognition / interaction / identification / cell to cell recognition / adhesion / signalling} / receptor qualified e.g. {hormone receptor / antigens}; 1

(c) (i) Secondary; 1

(ii) Ribosomes / rough endoplasmic reticulum; 1
Accept nucleus;
NOT golgi body / nucleolus.

(d) (i) Endocytosis (accept phagocytosis / pinocytosis); 1
NOT exocytosis.

(ii) Any 2: 2
Diffusion / osmosis;
Facilitated diffusion;
Active transport;

8.

(a)	(i)	0.4M; no units no marks.	1
	(ii)	-1052 (kPa); allow ECF	1
(b)		correct reference to osmosis; bathing solution {has a lower water potential / is more concentrated / is more negative / hypertonic} than the water potential of beetroot cells / ORA; water leaves / moved {out of / from} cells / into bathing solution; bathing solution became less dense / lighter than original sucrose solution; REJECT reference to water moving into or out of the drop.	4
(c)		$-790 = -1100 + \Psi_p$; $\Psi_p = 310$ kPa; 2 marks for correct answer.	2
(d)	(i)	Diagram shows cell plasmolysed (any stage); Mark diagram using labels. No labels = 0 marks. Any **2** correct labels from cell wall; plasma / cell membrane (part or all of which must be away from cell wall); tonoplast or vacuolar membrane; vacuole; IGNORE incorrect labels.	1 2
	(ii)	Plasmolysed / plasmolysis;	1
		Question total	**12**

9.

(a) (i) higher water potential outside rbc/lower inside;
(not: ref solute concentration / ref water concentration)
water moves in <u>by osmosis</u>;
down water potential gradient;
ref. no cell wall to prevent bursting/cell
membrane unable to withstand pressure. **[3]**

(ii) 4g dm^{-3}; **[1]**

(iii) different concentration/solute/ water potential of contents;
requires different concentration of external salts/water potential, for
movement of water/ to burst the cell **[2]**

(b) (i) temperature/pH;
change enzyme activity/reaction rate/diffusion rate/respiration rate
(not: time/root/ref fair test) **[2]**

(ii) active transport; **[1]**
is energy/ATP dependent;
aerobic respiration/oxygen required, to liberate energy/for <u>ATP</u> prod;
greater oxygen concentration produces greater uptake; **[2]**

(c) * all would be 7au; **[1]**
cyanide inhibits <u>aerobic</u> respiration/ inhibits cytochrome oxidase/
stops/ reduces prevents ATP production;
when no oxygen is present there is still some uptake;
by diffusion;
which is a passive process; **[2]**
must have *. Plus 2 others

(Total 14 Marks)

10.

(a) (i) fluid mosaic model;
mosaic of protein molecules/irregularly or randomly arranged;
lipid layer fluid/can move; **3**

(ii) A = phospholipid bilayer/fatty acid tails; (not: ref. hydrophobic)
B = extrinsic/surface protein/glycoprotein;
C = transmembrane/carrier/intrinsic protein; **3**

(iii) allows passage of polar/charged/ionic/hydrophilic molecules/facilitated diffusion; (allow: ref. water/non lipid soluble; not: named molecule) **1**

(b) movement up/against a concentration gradient;
requires energy/ATP; **2**

(c) maintain water potential;
obtain nutrients/metabolites or named e.g. glucose;
obtain oxygen/remove carbon dioxide;
secrete molecules;
remove toxic substances or named;
(not: waste products) **2 max**

(Total 11 marks)

11.

(a) cell/plasma membrane; **1**

(b) 50% of cells plasmolysed/point of incipient plasmolysis/membrane just in contact with wall/at incipient plasmolysis ΨP=0KPa;
because cell left in solution for one hour;
equilibrium reached/no net movement of water;
solute potential inside equal to that outside;
outside solution is given as -600kPa; **3 max**

(c) K is cell wall which is inelastic/won't stretch;
as protoplast/cell contents expand/swell; (not: ref. vacuole unqualified)
as water passes into cell;
pushes against expanding protoplast/cytoplasm/cell contents;
pressure potential is generated by resistance of cell wall; **3 max**

(Total 7 marks)

12.

(a) (i) C to B to A; [1]

(ii) water moves down a water potential gradient / high to low;

by osmosis; (not: ref. water concentration)

reference actual figures on diagram; [2]

(b) (i) Ψ = +1000 – 1800;

= - 800kPa [2]

(ii) plasmolysed; [1]

cell in concentrated solution / low water potential;

water passes out;

cytoplasm/vacuole shrinks. [2 max]
(not: cell membrane comes away from wall)

(c) (i) water passes into cell by osmosis;

cytoplasm expands;

cell becomes turgid;

as cytoplasm / contents push against wall;

wall inelastic / resists further expansion. (not:rigid) [3 max]

(ii) wilts. (not: dies) [1]

[Total 12 marks]

13.

(a) (i) Blood clots/infection. 1

(ii) Water has highest water potential/0 compared with -476/-896kPa; 3

Water passes down water potential gradient/from high to low water potential;

Passes into cell by osmosis.

(not: ref. water concentration)

(b) Diagram showing crinkled cells; (not: showing plant cell or nucleus) 3

Higher water potential inside cell;

Water passes out of cell (causing shrinkage/distortion).

7 MARKS

14.

(a) (i) X high

Y low

Z high (all three correct) [1]

(ii) There are folds in the membrane /

microvilli (which increases the surface area). [1]

(b) (i) C [1]

(ii) Moving sodium ions out of the cell will reduce their concentration and create a greater difference in concentration between the inside of the cell and the outside so ensuring a rapid rate of diffusion into the cell. [1]

(iii) as the temperature is increased kinetic energy/the movement of molecules increases; this results in an increase in rate of diffusion. (allow: diffuse faster) [2]

(c) (i) P = diffusion Q = facilitated diffusion (must have both) [1]

(ii) facilitated diffusion causes more rapid movement of

molecules through a membrane than simple diffusion;

it relies on protein carriers / channel proteins;

and the rate is limited by the number of proteins in the membrane i.e. protein carriers 'full';

therefore the curve flattens out; or converse

Diffusion – no carriers involved then just limited by concentration

gradient = 2 [2]
Q flattens out as channel proteins are fully occupied=2

(d) water potential is the capacity of water to leave or enter a system/cell [1]
Concentration free water molecules in a solution/ ref. kinetic energy

(e) (i) K cell wall [1]

J cell/plasma membrane [1]

(ii) cell is plasmolysed / cell membrane has pulled away from the

cell wall. Allow incipient plasmolysis, not: cytoplasm has shrunk [1]

(iii) cell wall is (fully) permeable;

sucrose diffused/moved through to T;

there must be the same (concentration) solution on

both sides of the wall; [2]

[Total 15 marks]

15.

(a) (i) Fluid Mosaic. [1]

(ii) Head labelled hydrophilic **AND** tail labelled hydrophobic. [1]

(b) Secondary structure is folding of polypeptide chain / ref. to α helix or β pleated sheet;

held by hydrogen bonds;

tertiary is folding of α helix or secondary structure / correct reference to specific 3D shape;

held by bonds between R groups / name at least 2 from

covalent, disulphide, ionic, salt bridges, hydrophobic, hydrogen, van der Waals.
Any 4 [4]

(c) (i) Charged groups will associate with (hydrophilic) heads

of lipids / layer; / hydrophobic inside hydrophilic outside.

Uncharged groups will associate with (hydrophobic) tails. [2]

(ii) Will associate with heads only / attach to outside or inside of the

membrane / correct use of extrinsic or would be surface protein. [1]
(not: would not be in the membrane unqual.)

[Total 9 marks]

16.

(a) **A.** Cell / plasma membrane **B.** Cell wall

C. Cytoplasm **D.** Tonoplast / vacuolar membrane

E. Vacuole **F.** Plasmodesma(ta)

(2 for all correct 1 if 1 mistake)

(b) Diffusion; osmosis; active transport; facilitated diffusion.
(Any 2) (not: apoplast/ symplast/ through F) [2]

(c) Cytoplasm / vacuole shrinks / gaps between wall and cytoplasm. [1]
(not: plasmolysis/cell shrinks)

(d) (i) The difference between the free energy of water molecules in a system and the free energy of molecules in pure water / the tendency for water molecules to leave / move out of a system. [1]
(not: ref. to equation)

(ii) Zero. [1]

(iii) P – 700 kPa.
Q – 600 kPa. [2]

(iv) From Q to P/ into P (not: out of Q). [1]
(independent mark from (iii))

[Total 10 marks]

17.

Graph A
Diffusion (allow: osmosis);
As concentration difference increases rate of uptake increases;
Not affected by respiratory inhibitors;
No ATP required / passive.
(not: energy)
No consequential error if type of uptake incorrect.

[max 3, diffusion 1 mark + 2]

Graph B
Facilitated diffusion;
At higher concentration differences rate of uptake slows down / levels plateau;
Transport/carrier/channel proteins / pores saturated / full/ number of pores is limiting factor;
Not affected by respiratory inhibitors.
No ATP required/passive
(not: energy) [max 3, facilitated diffusion 1 mark + 2]

Graph C
Active transport / active uptake;
Rate slows down;
Saturation of carriers / protein;
Affected/slowed by respiratory inhibitors;
Process needs ATP/it is an active process
(not: energy)
[max 3, active transport 1 + 2]

18.

(a) III should show two arms of membrane surrounding particle and meeting/almost meeting. IV should show restored membrane surface and vesicle enclosed in cell. 2 marks

Label 'vesicle' vacuole/plasma or cell membrane. 1 mark

(b) Surface area is reduced. 1 mark

(c) (i) Phagocytosis 1 mark

(ii) Exocytosis/secretion 1 mark

Total 6 marks

19.

4. Table

	D	FD	A
1.	+		
2.			+
3.		+	+
4.	+	+	
5.	+		
6.	+		
7.		+	+
8.			+

One mark for each correct tick. Minus one for each incorrectly ticked box.

Total 11 marks

20.

(a) (i) Solution A — 1 mark

(ii) Because the concentration of sugars (solutes) is lower in A. — 1 mark
(ie reference to all sugars and comparative)
(not: figures quoted)

(b) Fallen — 1 mark

Water moves from the low concentration solution into the more negative potential of solution B by osmosis/water potential — 1 mark
(linked marks)

(c) (i) Fructose — 1 mark

(ii) Glucose — 1 mark

Total 6 marks

21.

(a) (i) axes labelled plus units;

suitable scale;

points plotted accurately;

line drawn without extrapolation; — 4

(ii) 0.3M or from candidate's graph — 1

(iii) water moves from high to low water potential;

water potential outside cell same as inside/WP gradient zero;

isotonic;

no net movement of water/same amount in as out; — 3 Max
(not: no osmosis)

(b) (i) uptake affected by temperature;

temperature affects/reduces enzyme activity;

active transport requires energy;

from aerobic respiration;

cyanide stops respiration/inhibits enzyme activity;

reducing K^+ uptake;

3 Max

(ii) diffusion continues/not affected by cyanide/not an active process; — 1

[12]

22.

Available

Beetroot Q mark scheme

(i) {very little increase/0-7 units} up to {40ºC/first 4 temperatures;

rapid rise at 50ºC/rise from 7 to 80 at 50ºC;

small rise from 80 to 100 units from 50 to 70ºC. 2
higher temperature, darker solution/higher reading

(ii) Membrane (proteins) are stable between 10 and 40ºC/at low temperatures;

(Appearance of the red pigment means that) the (tonoplast and) cell membrane has been damaged between 40 and 50ºC/ at high temperatures;

(meaning) pigment has leaked out of cells/sap vacuole/ change in membrane permeability/damaged membrane;

proteins change shape/denature and come out of bilayer;

phospholipids bilayer has become too fluid/cannot retain proteins. 3

(iii) Dissolves phospholipids/destroys cell membrane structure;

(So) pigment leaks out. 1
(not: ref. to higher or lower readings)

Total 6 marks

23.

Line 1
diffusion lipid bilayer 3
concentration gradient/size of molecule
(not: ref. to surface area/fluidity)

Line 2
facilitated diffusion (channel/carrier) proteins
concentration gradient/size of molecules/pH 3
(allow: cell concentration, not: membrane pores)

Line 3
active transport carrier proteins
respiratory rate/ATP production (concentration)/pH 3
(allow: lowered if respiratory inhibitor present/O_2 levels,
not: channel proteins)
(box 1, if osmosis given, rest of line no marks)

[9]

24.

(a)	correct choice of cell in each case		2
(b)	(i)	50%	1
	(ii)	incipient plasmolysis	1
(c)	350(kPa)		1
(d)	(i)	From – 300 to – 600	1
	(ii)	– 450	1
			[7]

25.

(a)	hydrophilic/polar/phosphate head hydrophobic/non polar/fatty acid tail phospholipid intrinsic protein/protein pore or other correct (not: protein unqualified) extrinsic protein/carrier protein glycoprotein/glycolipid bilayer/drawn cholesterol glycocalyx/carbohydrate/polysaccharide 1 mark each if shown in correct position, max 5 if bilayer not shown	6
(b)	Fluid: phospholipids/molecules constantly moving/proteins move	1
	Mosaic: proteins do not form a continuous layer/patchy or scattered proteins/random pattern of proteins	1
(c)	Hydrophilic heads take up/attract aqueous 'stain', (hydrophobic tails repel stain)	1
(d)	Nucleus mitochondria chloroplast (two correct 1 mark, three correct 2 marks)	2
		[11]

26.

(a)	Zero / 0		(1)
(b)	(i)	400Kpa	(1)
	(ii)	900Kpa	(1)
(c)	(i)	Cell G	(1)
	(ii)	Cell E	(1)
(d)	Plasmolysis [Plasmolysed] (not: incipient plasmolysis / flaccid)		(1)
(e)	It would burst (swell) / lyse / water would move in. (not: turgid unless mentions lysis / gains weight)		(1)

Total 7 marks

27.

(a) (i)
A = Glycoprotein/carbohydrate/glycocalyx/ polysaccharide
(not: sugars/glycolipid)
B = Phosphate/polar group/hydrophilic head/ phospholipid head
C = Hydrocarbon/non polar tails/hydrophobic tails/fatty acids (not: tails/lipid layer)
D = Transmembrane protein/carrier protein/ channel protein/intrinsic protein
(not: protein)
E = Protein/extrinsic protein 5

(ii) Fluid mosaic/Singer and Nicholson 1
(not: mosaic)

(b) *Glucose*
Polar molecule
Phospholipid layer/hydrophobic region impermeable
Protein channels provide passage
Hydrophilic linings to channels (allow: water filled pores)
Ref. Protein carriers/transporter molecules/transmembrane protein 2
Ref. facilitated diffusion

Vitamin A
Non polar
Passes through directly/no channels required
Dissolves in phospholipid layer/hydrophobic regions 2
Diffusion

(c) Active transport
Osmosis 2
Endo/exo/phago/pino-cytosis or description
(not: ref. to diffusion or facilitated diffusion)

[12]

28.

(a) X = protein (1)
Y = (phospho) lipid (1)
Z = carbohydrate/polysaccharide/glycocalyx/glycoprotein (1)

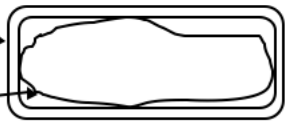
(b) Double layer; heads out tails in; 2 correct labels (3)

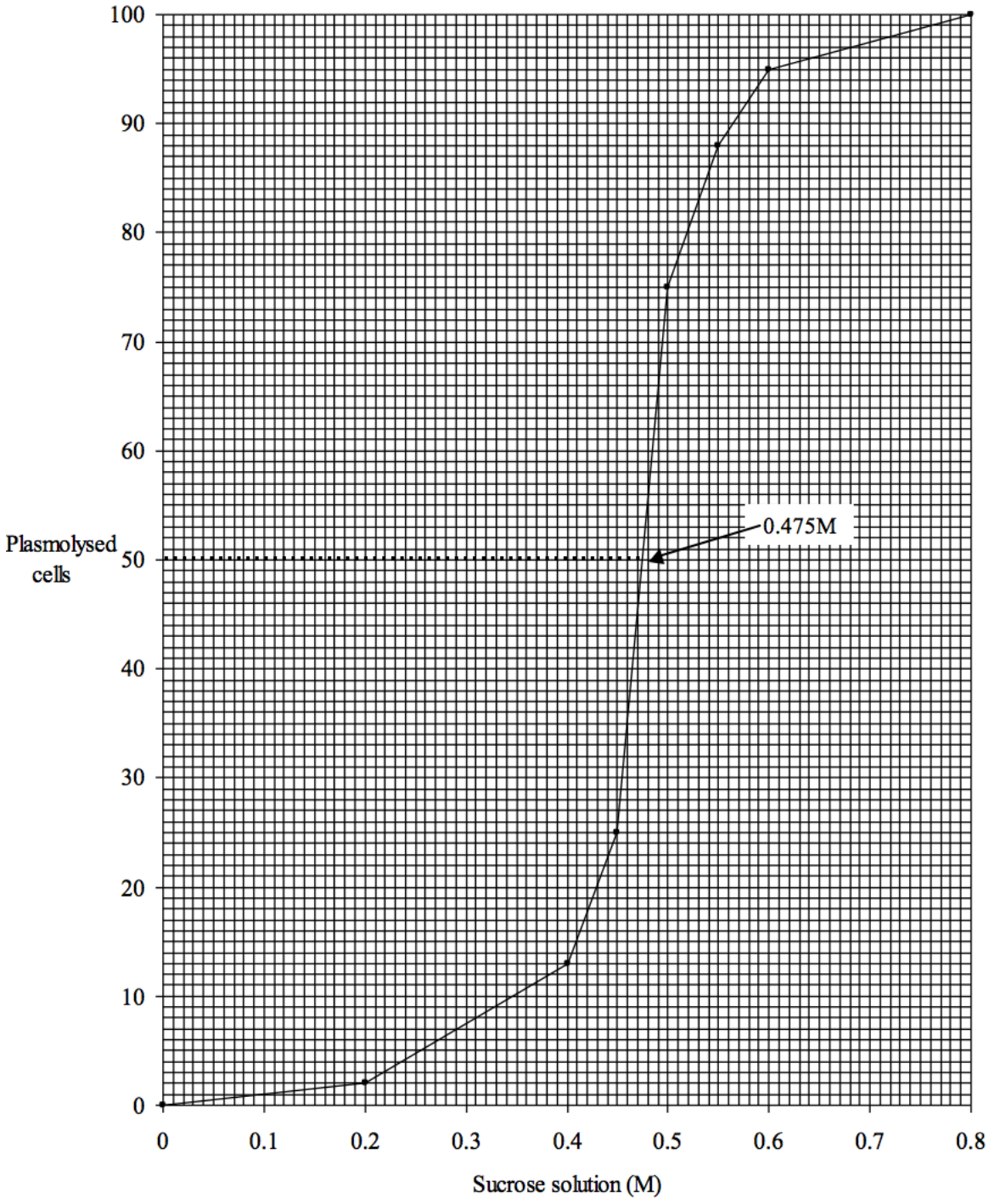
(c) Labelled molecules/x/protein (1) reference to mixing or equivalent (1) (2)

(d) Taking up nutrients/other requirements/reference to selective permeability; phagocytosis/secreting chemicals; cell recognition; adhesion; receptor sites.
(any 3) (3)
(not: controlling entry and exit/protection)

Total = 11 marks

29.

(a) (i)	Each axis correct and labelled – labels and units; axes correct way round, even scale over half space – minus 1 for each error.	2
	Plot correct.	1
	Lines correct – fine solid line, straight lines or curve *See graph overleaf.*	1
(ii)	0.475M (accept 0.47-0.48M) / or own graph	1
(iii)	Taken the reading where 50% of cells are plasmolysed / this is the point of incipient plasmolysis where ($\psi_p = 0$) / point where $\psi_s = \psi_{external\ solution}$ / solute concentration equals psi of external solution.	1
(b)	Drawing – double wall with gap between wall and membrane.	1
	Cell wall 	1
	Plasma / cell membrane	1
(c)	Place in (distilled) water;	1
	water will move into the cell (by osmosis) / because the psi external solution / water is higher than the cell / to a more negative water potential. (not: reference to water concentration)	1
		[11]


100
90
80
70
60
50
40
30
20
10
0
Plasmolysed cells
0.475M
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Sucrose solution (M)

30.

(a)	Is the movement of water from a dilute solution to a strong solution across a partially permeable membrane / Is the movement of water from a region of high / less negative water potential to a region of low / more negative water potential across a partially permeable membrane / Is the movement of water molecules across a partially permeable membrane from a region of high water concentration to a region of lower water concentration / down a concentration gradient	2
(b)	Turgid	1
(c)	Plasmolysed	1
(d)	Requires energy / ATP / involves other substances apart from water / against a concentration gradient / needs a carrier	1
(e)	Stops active transport / ATP production / is a respiratory inhibitor / inhibits. (not: slows it down)	1
		[6]

Essays
1.

(b)

A globular proteins show tertiary / quaternary structure;

B they have a {specific/precise} 3D shape;

C their shape is maintained by bonds between (atoms within the) R-groups;

D disulphide bridges / ionic bonds / hydrogen bonds / Van der Walls forces / hydrophobic interactions; (any 2) NOT peptide

E intrinsic proteins span the membrane;

F extrinsic proteins are {embedded in one half of the membrane / on the surface of the membrane};

G correct reference {made to the distribution of charge / polar and non-polar groups} on the {intrinsic/extrinsic} proteins;

H channel proteins have a hydrophilic pore;

I this allows {polar molecules/ions} to pass through the membrane;

J by (facilitated) diffusion; NOT active transport

K carrier proteins allow the passage of molecules {with a complementary shape/ by the protein changing shape ;

L by (facilitated diffusion and) active transport;

M Glycoproteins contain a carbohydrate chain attached to a protein;

N {Glycoproteins/ extrinsic proteins} act as hormone receptors / are involved in cell recognition;

O enzymes may be located in the membrane / catalyse reactions / carry out digestion / synthesise ATP;

Question 7 Total **[10]**

2.

(b) **Describe the effects of placing animal and plant cells in solutions of differing solute concentration.**

A Osmosis is the (net) movement of water molecules down a water potential gradient/from a higher water potential to a lower water potential;

B through a partially/selectively permeable membrane;

C Hypotonic solutions have a higher water potential than the (cytoplasm of the) cells;

D Water moves into the cells (by osmosis);

E Animal cells swell /burst/ref osmotic lysis; reject turgid

F Plant cells the cytoplasm swells up/cell contents/plasma membrane pushes against the cell wall;

G (plant cells) becomes turgid/ψ_p>0/cell wall prevents osmotic lysis;

H Hypertonic solutions have a lower water potential than the (cytoplasm of the) cells;

I Water moves out of the cells (by osmosis);

J Animal cells shrink/crenated; reject flaccid

K In plant cells the cytoplasm shrinks / the (plasma) membrane is pulled away from the cell wall;

L Plant cell becomes plasmolysed/ ψ_p=0;

M Isotonic solutions have the same water potential as the cytoplasm of the cell;

N (In isotonic solutions) there is no net movement of water molecules;

O At incipient plasmolysis 50% of the cells in a plant tissue will be turgid and 50% will be plasmolysed;

3.

(a)	A.	Singer Nicholson / fluid mosaic model;	[1]
	B.	Phospholipids / lipid bilayer;	[1]
	C.	Separate contents from outside / acts as barrier;	[1]
	D.	Phospholipid allows fat soluble substances through / selective;	[1]
	E.	Hydrophobic / water hating tails face each other;	[1]
	F.	Hydrophilic / water loving heads face water / outwards;	[1]
	G.	Carrier protein;	[1]
	H.	Used for active transport;	[1]
	I.	Specific substances transported;	[1]
	J.	Cholesterol affects fluidity;	[1]
	K.	Channel/carrier protein for facilitated diffusion;	[1]
	L.	some are enzymes;	[1]
	M.	Hydrophilic channels;	[1]
	N	Glycoprotein / glycolipid;	[1]
	O.	For cell recognition/signalling/hormonerecognition.	[1]

[Total 10 marks]

4.

(a)	A	Phospholipid bilayer (correct orientation)	1 mark
	B	Hydrophilic phosphate heads. Hydrophobic lipid tails.	1 mark
	C	Intrinsic protein channels/transmembrane/channel/carrier or	1 mark
	D	Extrinsic proteins (Any two for C and D)	1 mark
	E	Mention of glycocalyx (carbohydrate) on surface/or cholesterol in membrane	1 mark
	F	Mention of fluid mosaic.	1 mark
		(Four marks can be awarded from the six available)	
	G	Diffusion from high external to low internal concentration	1 mark
	H	Only lipid soluble molecules can pass through phospholipids layer	1 mark
	I	Other small molecules can diffuse through intrinsic protein channels	1 mark
	J	By means of facilitated diffusion.	1 mark
	K	Proteins can also act as carriers	1 mark
	L	Pick up molecule which changes protein configuration and ejects molecule on the other side of the membrane ('flip-flop')	1 mark
	M	This is active transport against concentration gradient	1 mark
	N	Active transport requires energy/uses ATP	1 mark
	O	Water molecules enter by facilitated diffusion along a WP gradient/by osmosis	1 mark
	P	Or by pinocytosis involving the formation of membrane vesicles	1 mark
		(Six marks can be awarded from the ten available)	
			(Total 10 marks)

5.

(b) [10]

A	diffusion;
B	high to low concentration/down a conc. gradient;
C	passive process/no energy/ATP involved;
D	facilitated diffusion;
E	requires use of carrier/channel protein/molecule; (not: intrinsic)
F	osmosis
G	movement of water from high to low water potential; (not: water concentration)
H	active transport;
I	ATP dependent;
J	against/up a concentration gradient;
K	protein carriers in membrane required;
L	endo/exocytosis/bulk transport;
M	active/energy ATP dependent process;
N	pinocytosis liquid/phagocytosis solid;
O	involves breakage of membrane/invagination; (not: pinching off)

6.

(a)

A. diffusion with example

B. down concentration gradient/from high to low concentration

C. no energy required/passive

D. facilitated diffusion (plus example)/cotransport and example

E. qualification of facilitated diffusion/cotransport e.g. carriers, faster, no energy (2 from 3)

F. active transport (with example)/diagram

G. qualification - energy, against concentration gradient, carriers (2 from 3)

H. osmosis water only

I. definition - high → low water potential/concentration, SPM

J. correct use of water terminology

L. water potential qualified, accept equation/turgor pressure/ Ψ_P opposes inward flow

M. phagocytosis/endocytosis qual

N. pinocytosis qual

O. exocytosis/vesicles qual

P. material injected bacteriophage

[10]

7.

(b)

A There are protein (lined) pores in the membrane. Accept diagram of membrane.

B Diffusion is the movement of molecules from a region of high concentration to a region of lower concentration / down concentration gradient.

C The rate of diffusion will depend on

D The concentration gradient / distance / temperature / size of molecules. Any 2/4.

E (Diffusion) can only happen for lipid soluble molecules / O_2 / CO_2 / small uncharged molecules. (Any one) or converse.

F Water moves by a process of osmosis.

G (Water moves) from a region of high water potential / concentration to a region of lower water potential / down a concentration gradient.

H Facilitated diffusion (allows substances, which are not lipid soluble to cross being) helped by special carriers / pores.

I Facilitated diffusion, osmosis and diffusion do not require ATP / are passive. Any 2/3.

J Large molecules can enter by phagocytosis / endocytosis.

K Particles become enclosed by membrane to form a vesicle and are transported into the cytoplasm (accept diagram).

L Pinocytosis is entry of liquids (by the same mechanism as phagocytosis).

M Active transport requires energy / ATP.

N (Active transport) moves substances against a concentration gradient.

O Protein / Carrier molecules are used (in active transport).

P Ref. to membrane structure e.g. Phospholipid in membrane / fluid mosaic.

Any eleven (11)

Total 11 marks

8.

(a)	*Diagram showing and correctly labelled:*	
A.	Phospholipid / lipid bilayer.	
B.	Intrinsic or transmembrane / extrinsic protein position / (hydrophilic) pore or channel.	
C.	Proteins.	
D.	Sugar / carbohydrate chains / glycocalyx / glycolipids / glycoproteins.	
E.	Quality of diagram.	
F.	Explanation of phospholipid bi-layer – hydrophilic / water loving head facing water / outwards if on drawing.	
G.	Explanation of ionic / non-ionic / polar / non-polar nature of phospholipid.	
H.	Hydrophobic / water hating tails facing each other.	
I.	Description of protein function – 2 examples:	
J.	transport proteins hydrophilic pores enzymes receptors.	
K.	Sugar chain function – 2 examples:	
L.	cell recognition blood groups / tissue types antigens / immunological recognition / foreign cells. embryology.	
M.	Phospholipids will allow fat soluble molecules through.	
N.	Singer and Nicholson's fluid mosaic model. Explanation of the fluid movement of phospholipids / mosaic of proteins or analogy of proteins in a sea of phospholipids.	
	Maximum 10 marks.	10